

An Improved In Situ and Satellite SST Analysis

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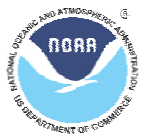
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Introduction

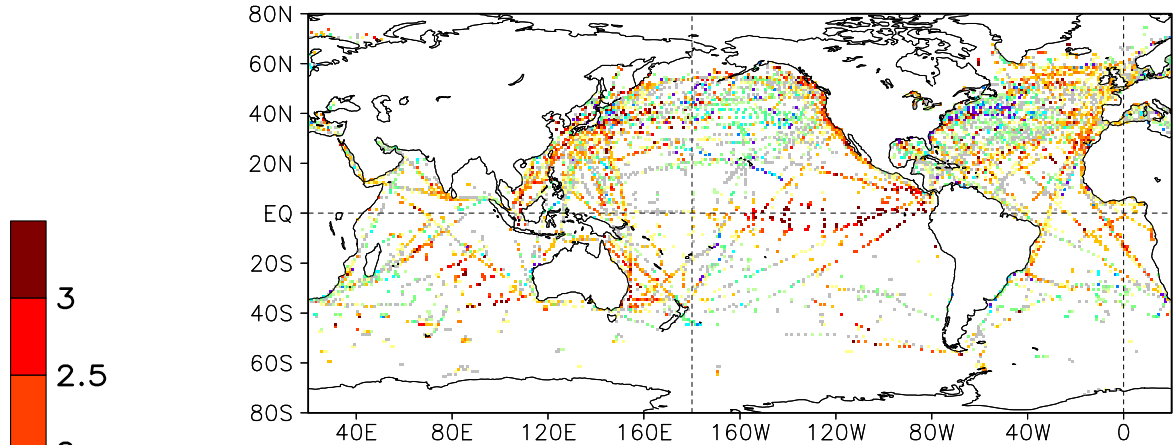
- Examine SST Differences for 1982 – present
 - Focus on climate scales SSTs
- Discuss Changes in NOAA OI
 - OI version 2 (OI.v2)

Main Topics

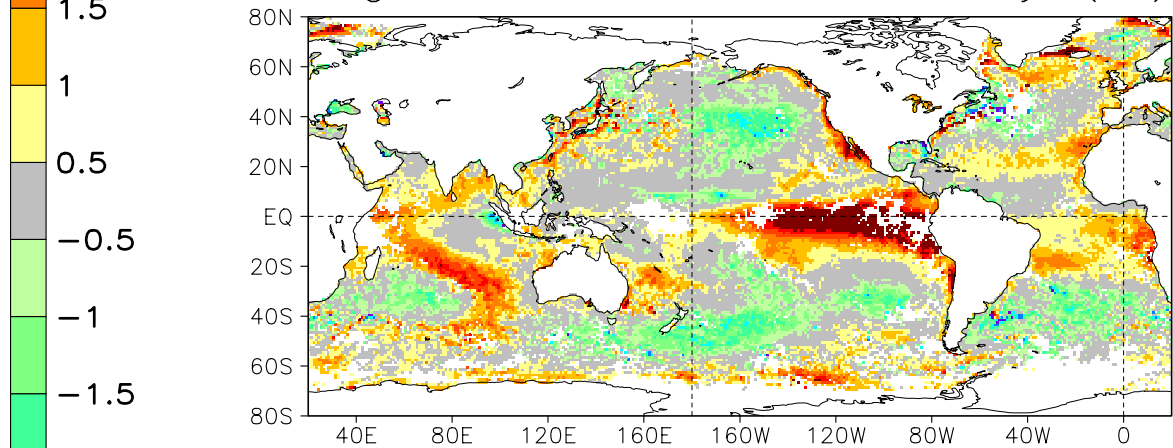
1. Overview
2. In Situ Differences
3. Satellite Differences
4. Analysis Differences

SST Anomaly Data and Analysis

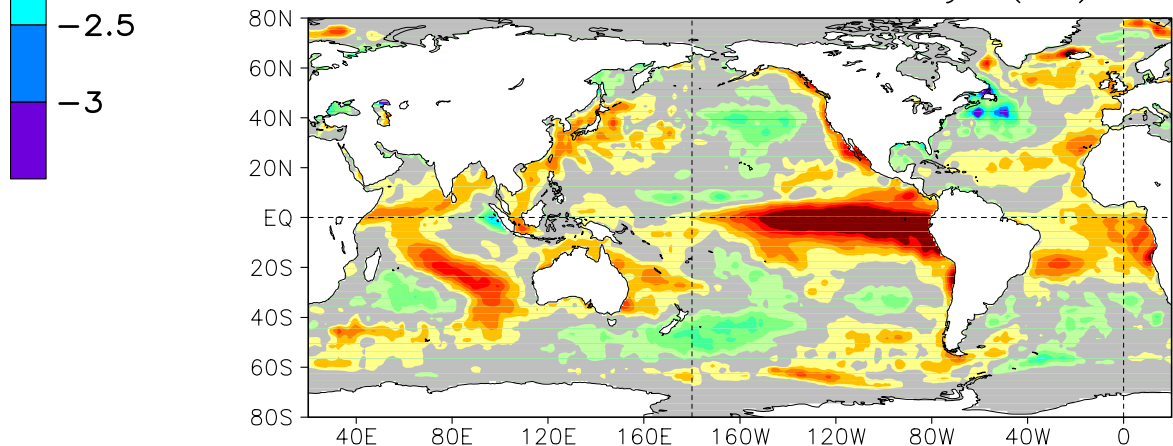
14–20 December 1997
Ship + Buoy SST Anomaly(°C)



Night Satellite SST Anomaly (°C)



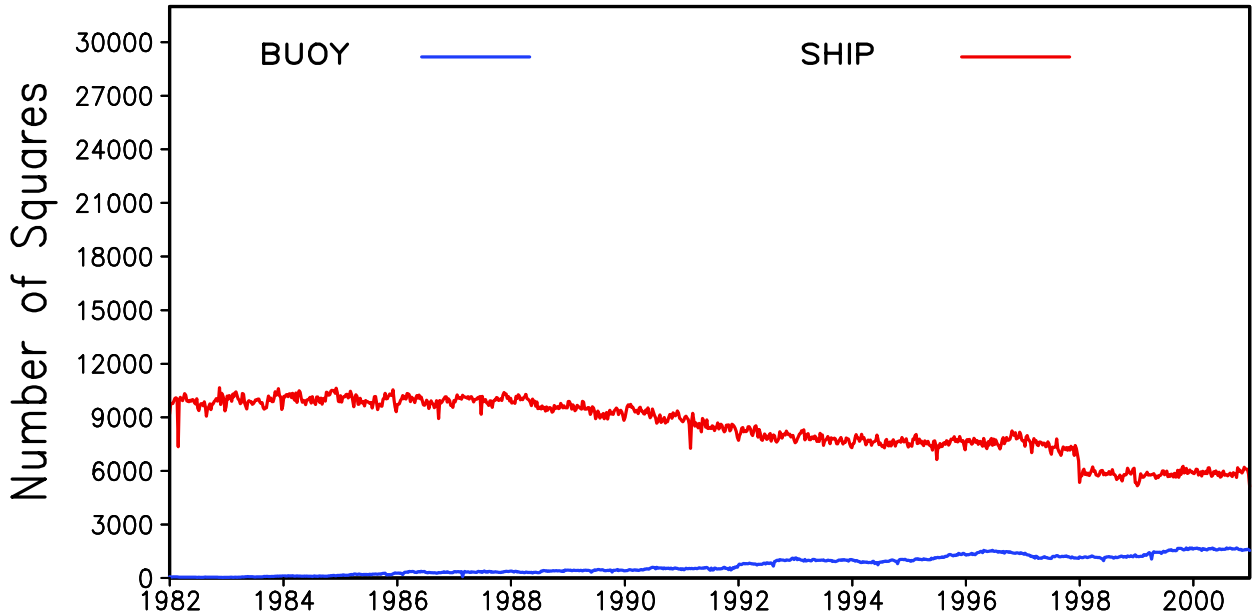
NCEP OI SST Anomaly (°C)



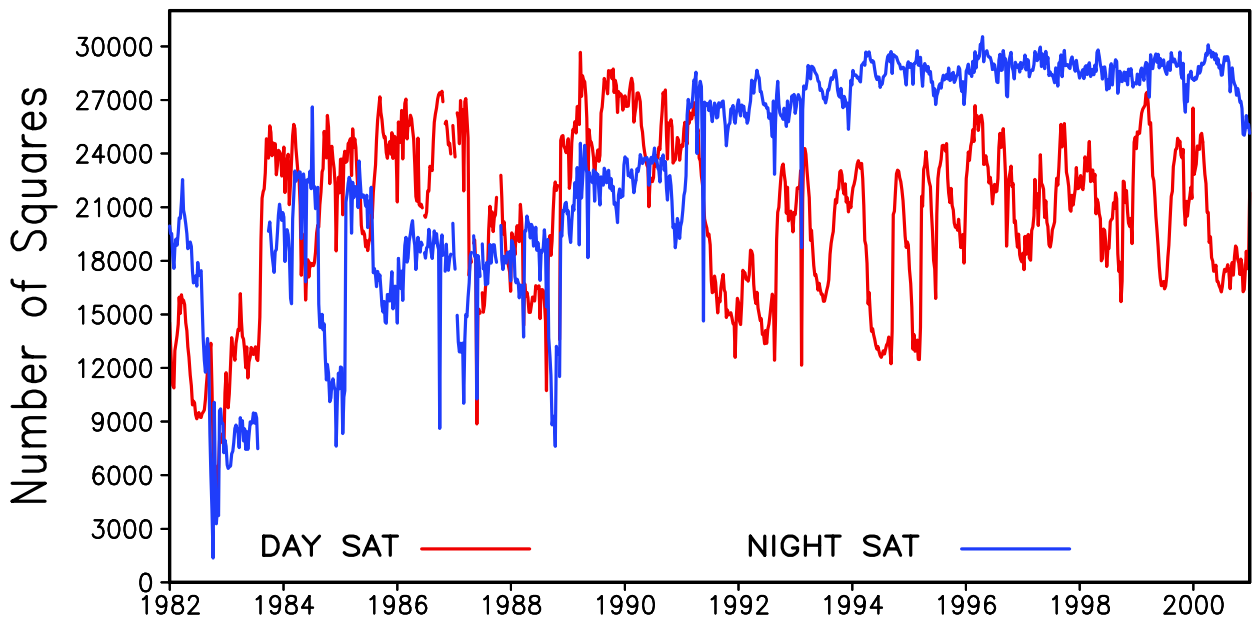
Data Coverage

Latitude Range: 60°S–60°N

In Situ 1° Data Squares



Satellite 1° Data Squares



Ship Minus Buoy Differences
on 1° weekly collocated grid

Region	No. Pairs	Bias
60°S-20°S	17,753	0.08°C
20°S-20°N	45,605	0.04°C
20°N-60°N	160,180	0.17°C
60°S-60°N	223,538	0.14°C

All weeks: 1982-2000

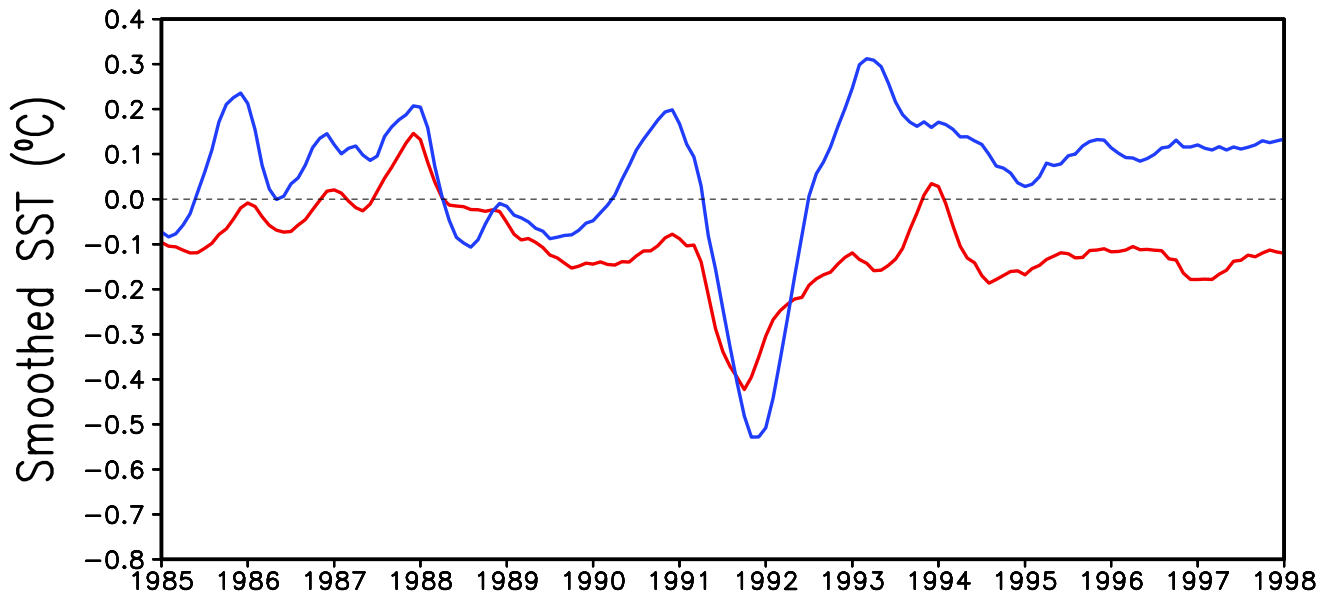
Monthly Data Summaries

- In Situ Data from the Comprehensive Ocean-Atmosphere Data Set (COADS)
 - Reference data set for intercomparisons
 - Version: enhanced COADS (E-COADS)
- Satellite AVHRR Retrievals
 - (tuned with respect to buoys)
 - Operational
 - Daytime
 - Nighttime
 - Algorithm: RSMAS/NESDIS/US Navy
 - Pathfinder (Reanalysis)
 - January 1985 – December 1997
 - Daytime
 - Nighttime
 - Algorithm: RSMAS/JPL

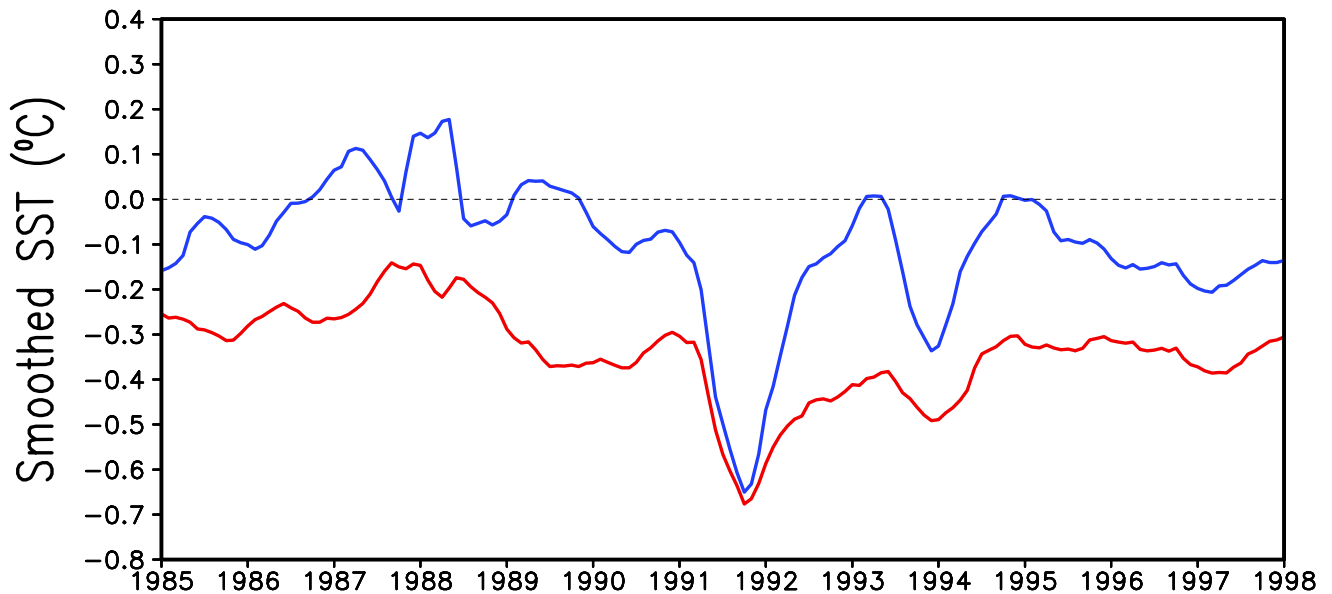
Satellite Data wrt E-COADS

Latitude Range: 60°S–60°N

DAY Satellite SST wrt E-COADS



NIGHT Satellite SST wrt E-COADS



Pathfinder

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Operational

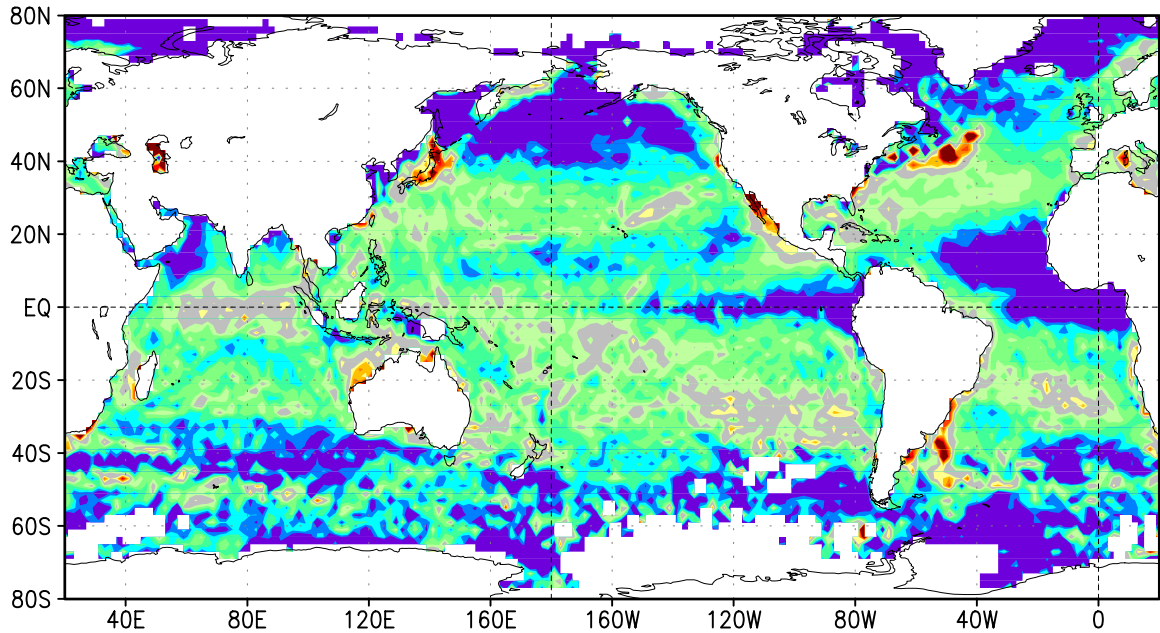
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Nighttime Satellite wrt E-COADS

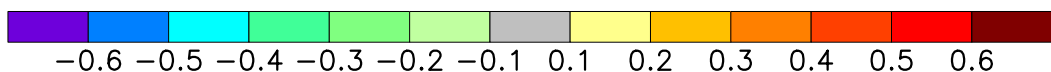
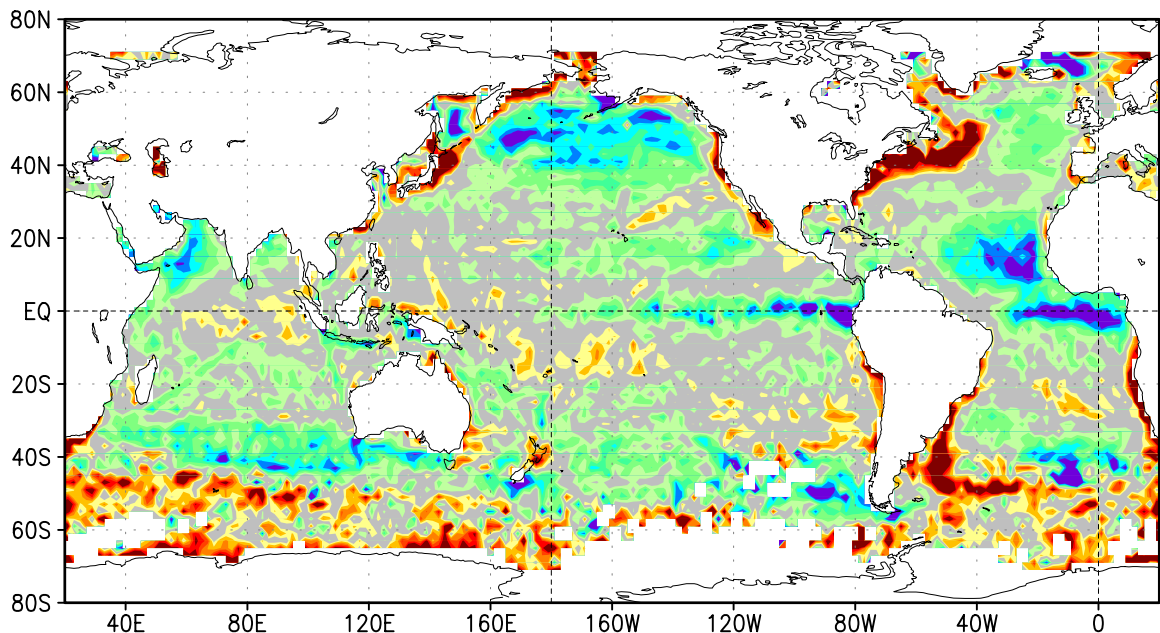
Pinatubo period excluded

Bias: Jan1985–May1991, Jun1992–Dec1997

PATH NTE – E-COADS



OPER NTE – E-COADS



SST Analyses

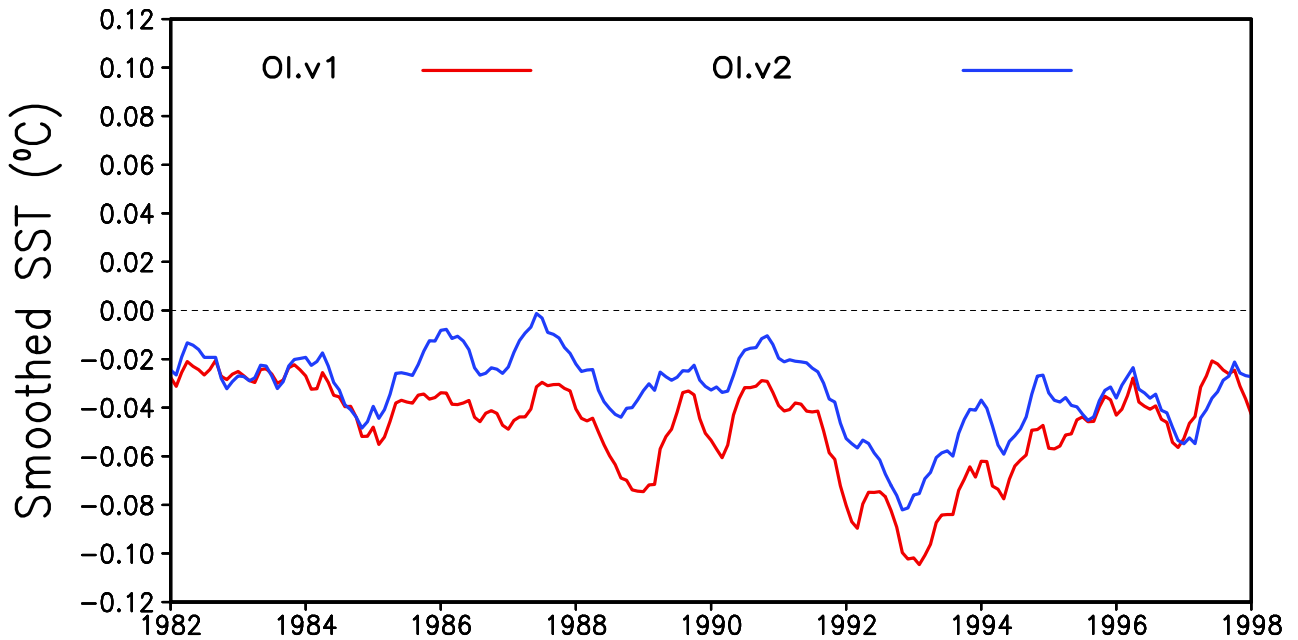
All use in situ & operational AVHRR data

- NOAA OI.v1
 - Reynolds and Smith, 1994, Journal of Climate
- NOAA OI.v2
 - Reynolds, Rayner, Smith, Stokes and Wang, 2002, Journal of Climate, in press
 - Used UK sea-ice to SST algorithm based on climatological fit
 - Used COADS data through 1997
- UK Global sea-Ice and SST (GISST)
 - Rayner, Horton, Parker, Folland, Hackett, 1996, unpublished manuscript
- UK Hadley Centre sea-Ice and SST (HadISST)
 - Parker, Rayner, Horton and Folland, 1999, WMO Workshop on Advances in Marine Climatology-CLIMAR99

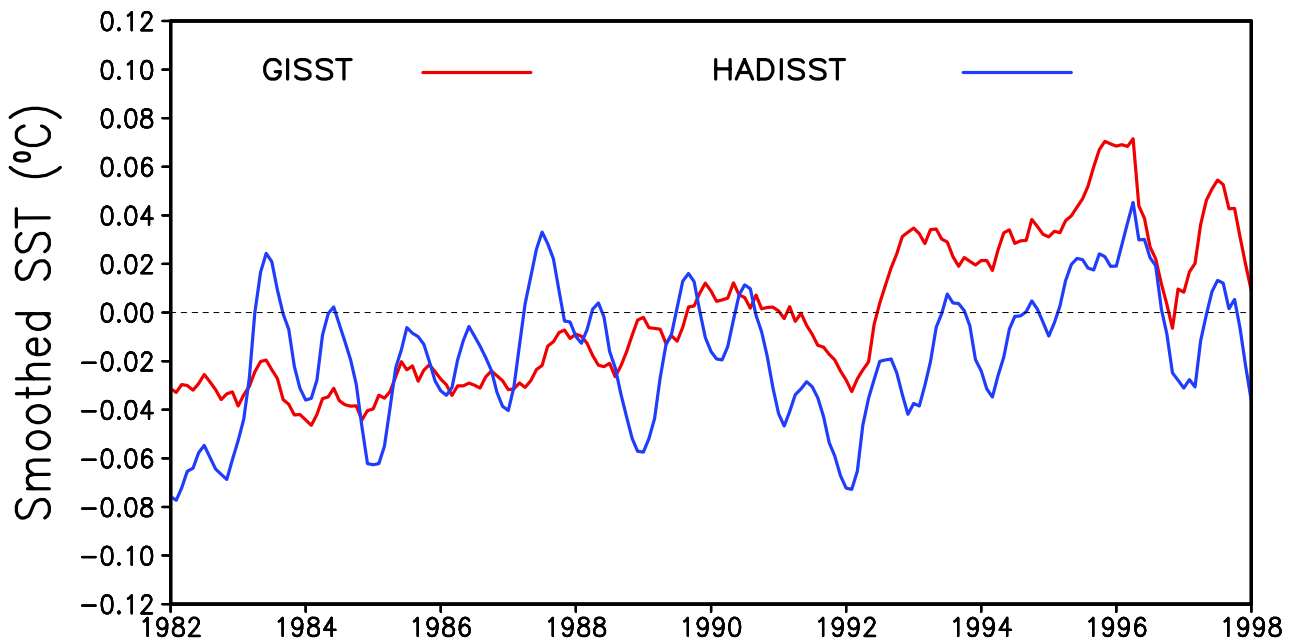
Analysis Differences wrt E-COADS

Latitude Range: 60°S–60°N

NOAA SST wrt E-COADS



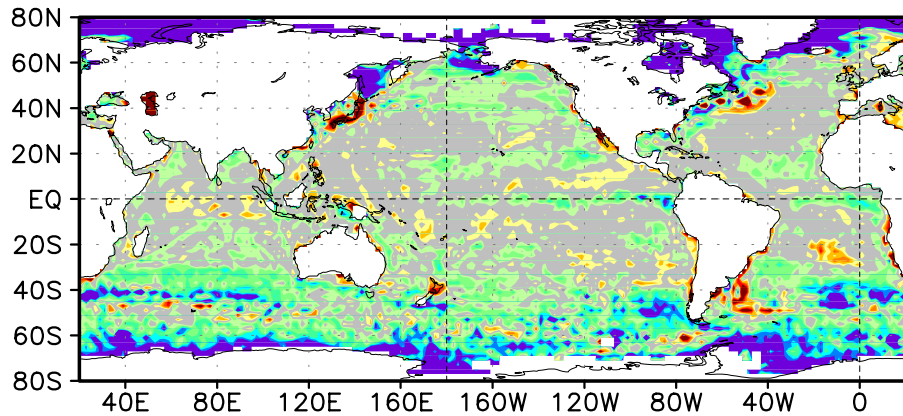
UK SST wrt E-COADS



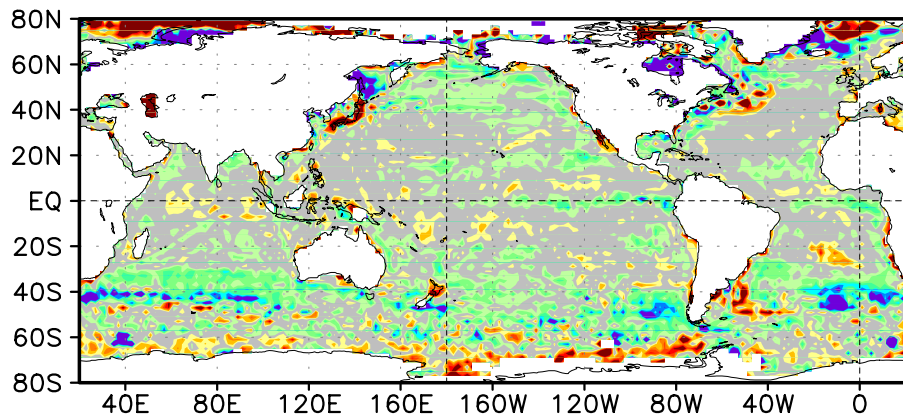
Analysis Differences wrt E-COADS

Bias: JAN1982 to DEC1997

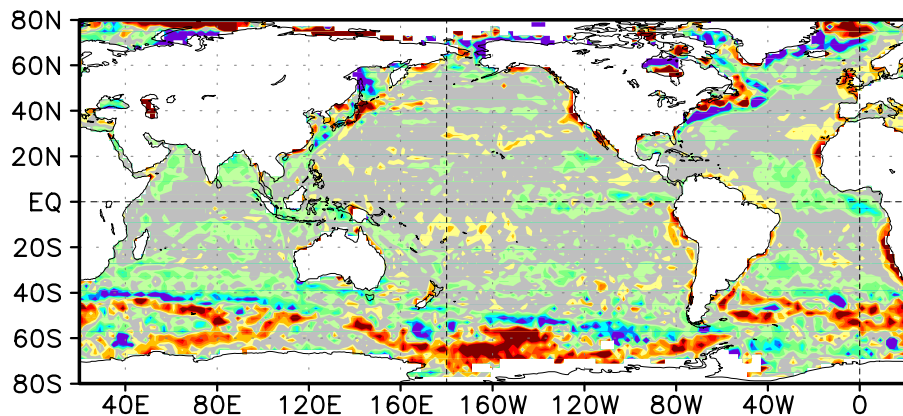
Ol.v1 - E-COADS



Ol.v2 - E-COADS



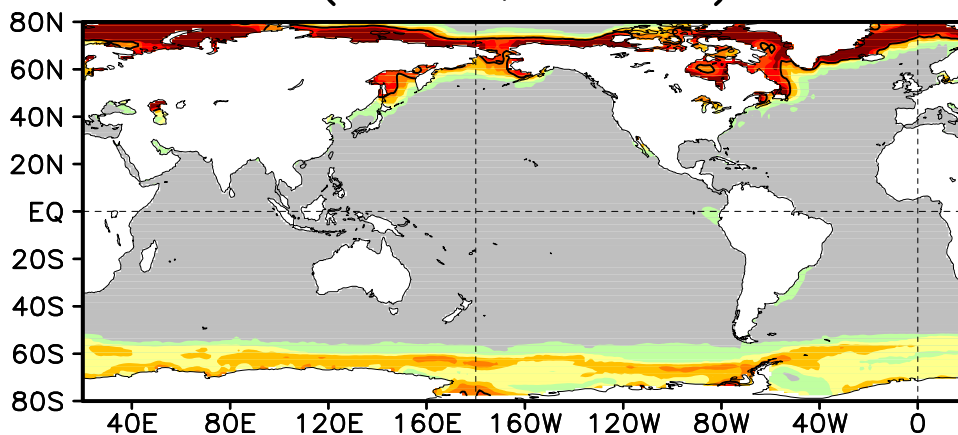
HADISST - E-COADS



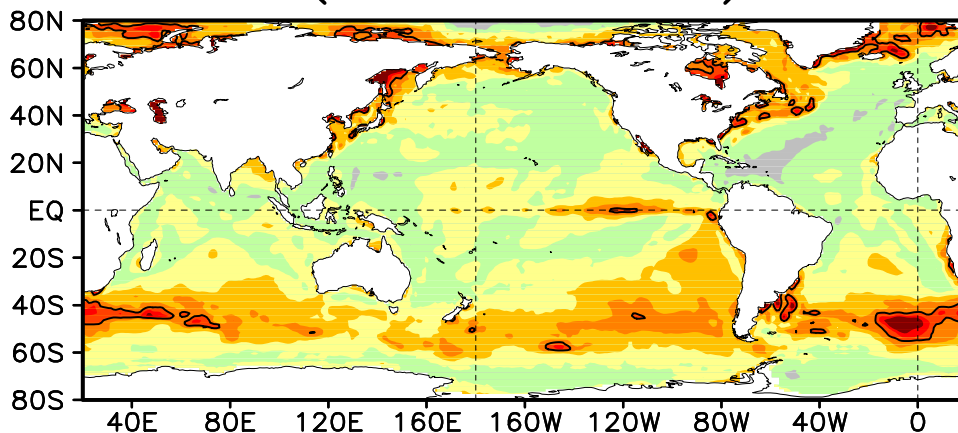
RMS Differences wrt OI.v2

RMSD: JAN1982 to DEC1999

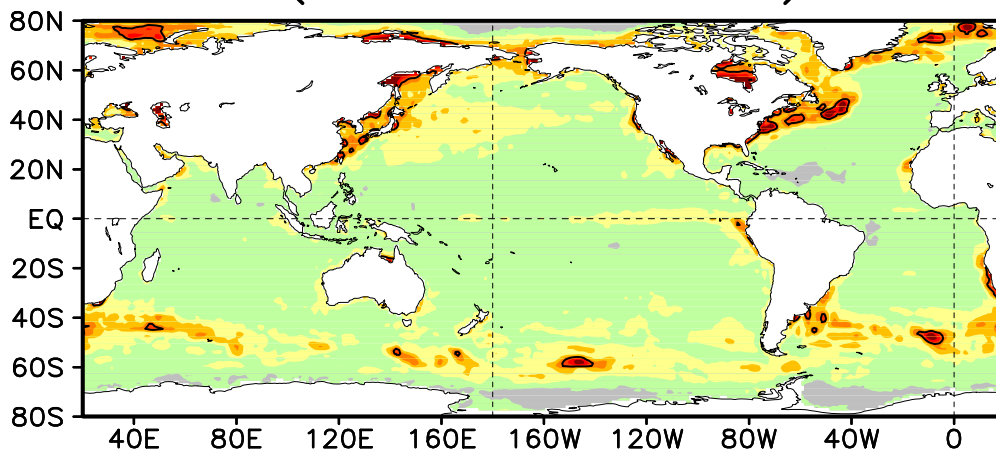
(OI.v1, OI.v2)



(GISST, OI.v2)



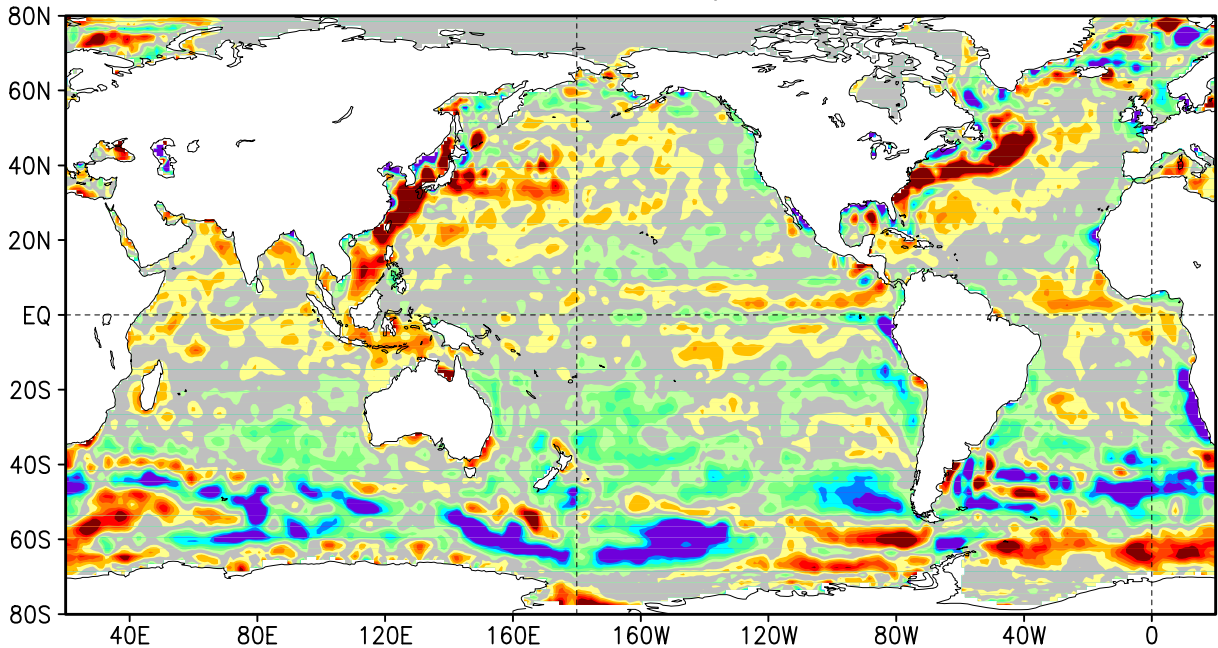
(HADISST, OI.v2)



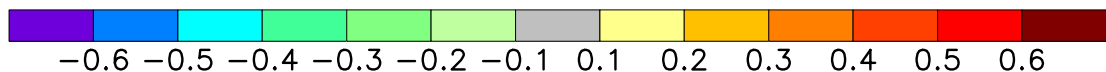
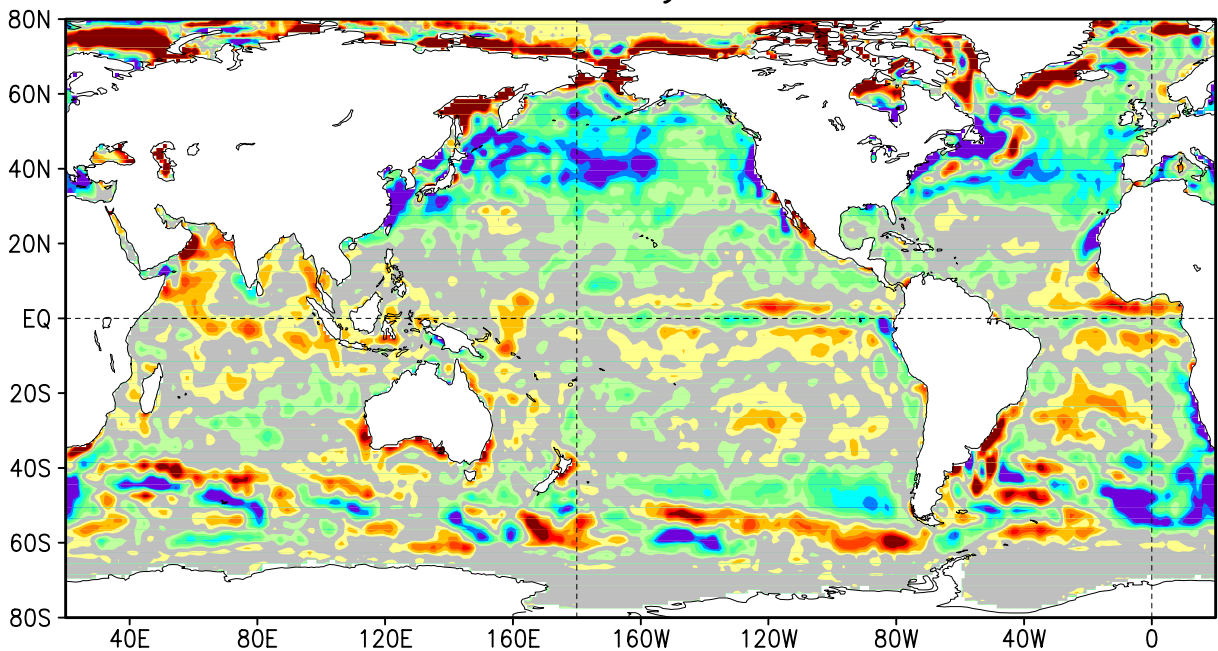
Seasonal Differences

Bias (OI.v2 - HADISST): 1982-1999

January



July



Objective Determination of Analysis Accuracy

- Withhold a random 20% of buoy SSTs from analyses
 - Define set as buoy IDs ending in 4 or 9
- Use withheld buoy data for objective comparison
 - Compute Bias and RMSD between buoys and analyses

Conclusions

- Significant differences remain among analyses
 - Global average differences of $\sim 0.05^{\circ}\text{C}$
 - RMS differences of 1°C are common
 - Tropical differences are the lowest
 - Largest uncertainties occur in sparse data regions: especially in sea-ice margins
- Comparisons with E-COADS (enhanced COADS) were useful to examine large space and time scale differences
- An objective method is needed to better quantify the differences

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